

I claim:

- 1 1. A radio frequency transmitting method for the transmission of digital data,
2 comprising:
3 abrupt phase shift keying the digital data; and
4 filtering the data digital with a bandpass filter having essentially no group delay.
- 1 2. The method of claim 1 where the abrupt phase shift keyed digital data results in a
2 carrier bearing phase shift information and removable Fourier sidebands, which do not
3 contribute to the phase modulation angle.
- 1 3. The method of claim 2 where filtering the phase shift keyed digital data reduces
2 the modulation sidebands, which are Fourier amplitude modulation products only.
- 1 4. The method of claim 1 where the phase shift keyed digital data has a carrier and
2 Fourier sidebands, and where abruptly phase shift keying the digital data inserts
3 substantially all necessary phase modulation information into the carrier alone with an
4 insubstantial amount of any necessary phase modulation information inserted into the
5 Fourier sidebands.

1 5. The method of claim 1 where abruptly phase shift keying the digital data
2 comprises phase shift keying the digital data in the NRZ format.

1 6. The method of claims 1 or 5 where any two phase baseband format or code is
2 employed to abruptly phase shift the carrier.

1 7. Receiving means for the method of claim 1, further comprising reducing the noise
2 bandwidth with an ultra narrow bandpass filter, detecting abrupt phase changes, and
3 decoding the detected abrupt phase changes into digital ones and zeros along with a
4 corresponding data clock.

1 8. The method of claim 7 where the abrupt phase shift keyed digital signal does not
2 have a Nyquist bandwidth resulting from Bessel products and wherein reducing noise
3 bandwidth with an ultra narrow bandpass filters comprises using a filter having a
4 bandpass narrower than the Nyquist bandwidth of the phase shifted keyed digital data
5 so that information encoded in the phase changes in the digital data is found in the
6 carrier alone.

1 9. The method of claim 7 where the abrupt phase shift keyed digital signal does not
2 have a Nyquist bandwidth and wherein reducing the noise bandwidth with ultra narrow
3 bandpass filters comprises using a filter having a bandpass narrower than the Nyquist
4 bandwidth of the phase shifted keyed digital signal so that the noise power in the

5 received phase shifted keyed digital data is greatly reduced compared to that of
6 conventionally generated phase modulated signals.

1 10. The method of claims 1 or 7 further comprising utilizing abrupt phase change
2 pulses of different phase angles to indicate a digital one or zero.

1 11. The method of claim 7 further comprising synchronizing a recovered data clock
2 with the received abrupt phase change pulses.

1 12. A circuit for phase shift keying a digital data signal comprising:
2 a phase change modulator which abruptly changes phase of the digital data
3 signal; and
4 an ultra narrow bandpass filter which has a substantially zero group or envelope
5 delay communicating with the phase change modulator to output a bandpass filtered
6 form of the abruptly phase changed digital data signal.

7 13. The circuit of Claim 12 wherein the digital data signal has a carrier frequency
8 plus sideband frequencies which are not used, and where the ultra narrow bandpass
9 filter and the phase modulator in combination reduce the level of said sideband
10 frequencies.

1 14. The circuit of claim 13 where the sideband frequencies reduced by the ultra
2 narrow bandpass filter and the phase modulator in combination are Fourier products.

1 15. The circuit of claim 13 wherein the digital data signal carrier is modulated by the
2 phase change modulator to retain an information content, and wherein the sideband
3 frequencies reduced by the ultra narrow bandpass filter and the phase modulator in
4 combination have substantially no necessary information content, the carrier having
5 substantially all the necessary information content.

1 16. The circuit of claim 12 where the phase change modulator changes the phase of
2 data according to the NRZ format.

1 17. The circuit of Claim 12 where the phase change modulator changes the phase of
2 the signal according to any two phase format or baseband code.

1 18. The circuit of claim 12 further comprising a receiver including an ultra narrow
2 bandpass filter to reduce the noise bandwidth, a limiter, a phase detector to detect the
3 abrupt phase changes, and a decoder to convert the detected abrupt phase changes to
4 digital ones and zeros along with a data clock.

1 19. The circuit of claim 18 wherein the modulated digital data signal does not have a
2 Nyquist bandwidth and wherein the ultra narrow bandpass filter in the receiver has a

3 noise bandwidth much narrower than the Nyquist bandwidth, causing the noise power in
4 the receiver to be greatly reduced compared to that of conventionally generated PM
5 signals.

1 20. The circuit of claim 18 further comprising processing circuitry to provide output
2 pulses of a polarity indicating a digital one or zero.

1 21. The circuit of claim 20 where the processing circuitry provides pulses processed
2 to provide a phase noise improvement.

1 22. The circuit of claim 21 further comprising a storage circuit communicating with a
2 phase detector, which storage circuit is set to hold the last change pulse polarity until a
3 new change pulse is received, where the pulse polarity indicates a digital zero or one.

1 23. The circuit of claim 18 further comprising a clock recovery means to synchronize
2 a recovered data clock with the abrupt phase change pulses received by the receiver.

1 24. A shunt filter having zero group delay at a single frequency, capable of passing
2 abrupt phase changes without adverse effect, comprising:
3 a crystal resonator operated in the parallel mode, so as to represent an infinite
4 shunt impedance to the input at the single frequency and a lower finite shunting
5 complex impedance at all other frequencies.

1 25. The shunt filter of claim 24, wherein the shunt filter has a very narrow noise
2 bandwidth, said bandwidth being much narrower than the Nyquist bandwidth of a
3 abrupt phase change modulated signal it is intended to pass.

1 26. The shunt filter of claims 24 or 25, further including complex reactances in series
2 or parallel with the resonator whereby the shunt filter is tunable.